

Appl. No. 10/086,497
Amendment dated: February 27, 2004
Reply to Restriction Requirement of November 28, 2003

REMARKS

In response to the Office Action dated November 28, 2003, Applicants respectfully request reconsideration based on the above claim amendment and the following remarks. Applicants respectfully submit that the claims as presented are in condition for allowance.

Claims 1-7 and 16-18 are pending in the present application and claims 1-3, 5-7 and 16-18 have been examined. Claims 1 and 5-6 have been amended, and claims 2-3 and 16 have been canceled without prejudice. Support for the amendment can be found in the entire specification, for example, lines 2-6 of page 8 of the Specification. No new matter has been added by the amendment.

Claim Rejections Under 35 U.S.C. § 103

Claims 1, 7 and 17-18

Claims 1, 7 and 17-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kadomura, U.S. Patent 5,401,358 (hereinafter "Kadomura") in view of Minton et al., U.S. Patent 5,883,005 (hereinafter "Minton") and further in view of Hamamura et al., U.S. Patent 5,342,448 (hereinafter "Hamamura") for the reasons stated on the pages 3-4 of the Office Action.

Claim 1 is a layer-by-layer etching apparatus using a neutral beam, the layer-by-layer etching apparatus, comprising a reaction chamber having a stage therein on which a substrate to be etched is mounted; a neutral beam generator, including: an ion source for extracting an ion beam having a predetermined polarity from a source gas and for accelerating the ion beam; and a plate-shape reflector which is positioned in a path of the accelerated ion beam and is tiltable to control an incident angle of the accelerated ion beam in a range of 75 to 85 degree from a vertical line with respect to a surface of the reflector, whereby the reflector reflects and neutralizes the accelerated ion beam to generate a neutral beam and to supply the neutral beam into the reaction chamber; a shutter disposed between the neutral beam generator and the reaction chamber, for controlling the supply of the neutral beam into the reaction chamber; an etching gas supply for supplying an etching gas into the reaction chamber; a purge gas supply for supplying a purge gas into the reaction chamber; and a controller for controlling the supply of the source gas, the etching gas, and the purge gas and opening and closing of the shutter.

The Examiner states that although Kadomura, Minton and Hamamura fail to expressly disclose the reflector of the original claim 3, Col. 6, lines 32-40 and Col. 27, lines 22-49 of

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Asakawa et al., U.S. Patent 5,776,253 (hereinafter "Asakawa") discloses the use of a plate-shape metal reflector positioned in the path of the beam for reflecting and neutralizing the beam. Applicants respectfully disagree with the Examiner as the following reasons. The reflector of claim 1 has a plate shape, while Col. 27, line 25 of Asakawa discloses the reflector (12a in Fig. 5) has a diamond structure. Further, Asakawa does not teach "whereby the reflector reflects and neutralizes the accelerated ion beam to generate a neutral beam", recited in claim 1.

Furthermore, the feature "a plate-shape reflector which is positioned in a path of the accelerated ion beam and is tiltable to control an incident angle of the accelerated ion beam in a range of 75 to 85 degree from a vertical line with respect to a surface of the reflector", as recited in claim 1, is not taught or suggested by any of Kadomura, Minton, Hamamura and Asakawa. Although the Examiner states that Fig. 1 and Col. 5, lines 51-68 of Fetzner et al., U.S. Patent 4,794,258 (hereinafter "Fetzner") discloses an apparatus with a neutral beam that includes a reflector (12) which is tiltable to control an angle of incidence of the ion beam which is incident thereto, Fetzner does not teach or suggest the specific incidence angle of the ion beam with respect to the surface of the reflector. Thus, Fetzner does not have an effect for preventing the reflected neutral beam from bombarding unnecessary ions and dispersing, thereby inhibiting an anisotropic etching process, which is obtained by the invention of claim 1.

Thus, any combination of Kadomura, Minton, Hamamura, Asakawa and Fetzner does not teach or suggest all the features of claim 1, for example, the feature "a plate-shape reflector which is positioned in a path of the accelerated ion beam and is tiltable to control an incident angle of the accelerated ion beam in a range of 75 to 85 degree from a vertical line with respect to a surface of the reflector, whereby the reflector reflects and neutralizes the accelerated ion beam to generate a neutral beam and to supply the neutral beam into the reaction chamber", as recited in claim 1. Accordingly, claim 1 is believed to be patentable over the combination of Kadomura, Minton, Hamamura, Asakawa and Fetzner. Claims 7 and 17-18 depend from claim 1, and thus are believed to be allowable due to their dependencies on claim 1.

Claims 2-3 and 5

Claims 2-3 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kadomura in view of Minton and Hamamura, and further in view of Asakawa for the reasons stated on the pages 4-5 of the Office Action. Since claims 2-3 have been canceled

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without prejudice, the rejection of claims 2-3 is moot. Claim 5 depends from claim 1, thus is believed to be allowable due to its dependency on claim 1.

Claim 16

Claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kadomura in view of Minton and Hamamura and further in view of Asakawa and further in view of Petzer for the reasons stated on the pages 5-6 of the Office Action. Since claim 16 has been canceled without prejudice, the rejection of claim 16 is moot.

Claim 6

Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kadomura, in view of Minton and Hamamura and further in view of Asakawa, and further in view of Chen et al., U.S. Patent 6,331,701 or Löb, U.S. Patent 5,036,252 (hereinafter "Löb") for the reasons stated on the pages 6-7 of the Office Action.

Chen or Löb does not teach or suggest the feature "a plate-shape reflector which is positioned in a path of the accelerated ion beam and is tiltable to control an incident angle of the accelerated ion beam in a range of 75 to 85 degree from a vertical line with respect to a surface of the reflector, whereby the reflector reflects and neutralizes the accelerated ion beam to generate a neutral beam and to supply the neutral beam into the reaction chamber", as recited in claim 1. Thus, Chen or Löb does not cure the deficiency of the combination of Kadomura, Minton, Hamamura and Asakawa. Accordingly, the combination of Kadomura, Minton, Hamamura, Asakawa, Chen or Löb does not render claim 1 obvious. Claim 6 depends from claim 1, thus is believed to be allowable due to its dependency on claim 1.

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Conclusion

In view of the forgoing amendments and remarks, Applicants submit that this application is in condition for allowance. Early notification to this effect is requested.

If there are any charges due in connection with this response, please charge them to Deposit Account 06-1130.

Respectfully submitted,
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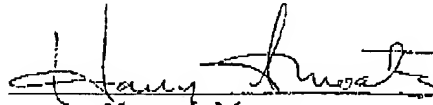
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Expires: August 4, 2004



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